

## Operating Instructions

Immersion thermostat  
Compact thermostats  
Medico thermostat  
Series MT  
to DIN 12 879

From Series G 80  
05/89  
YAEE0003

<u>Contents</u>	<u>Page</u>
1. Brief operating instructions	2
2. Table of Data	3
3. Basic construction	6
4. Safety systems	6
5. Bath liquids and tubing	7
6. Unpacking, assembly and setting up	8
7. Connecting external systems	9
8. Cooling the thermostat	10
9. Starting up	10
10. Operation of the safety circuit	11
11. Maintenance	12

#### Enclosures

Accessories

Spares

Circuit diagram

Summary of LAUDA thermostats


1. Brief operating instructions

- 1.1 Check thermostat and accessories during unpacking for possible transport damage and, if necessary, notify carrier or post office.
- 1.2 Assemble unit according to Section 6 and add items as appropriate.
- 1.3 Connect the tubing at the pump outlets on the thermostats MT 3, MT 12, MT 20 and MT 6:

Without external circulation: link together the pump outlets with the perbunan tubing supplied.

With external circulation: connect tubing to the external system.

Secure tubing with clips to prevent it slipping off.

- 1.4 When operating in the ambient temperature range connect external cooling according to Section 8.
- 1.5 Use only deionised water (see Section 5). Fill the unit up to approx. 2 cm below the top plate.
- 1.6 Check the supply voltage against the data on the rating label. Connect the cable to the supply.
- 1.7 Select the required temperature.
- 1.8 Switch on the unit with the mains switch (green lamp lights up).
- 1.9 When operating with an external system ensure that the level inside the thermostat does not drop too much when the external system is being filled with the bath liquid.
- 1.10 When the bath liquid has reached the set temperature the yellow indicating lamp "heating"  begins to flash. Check the operating temperature on the reference thermometer and adjust temperature setting if necessary.
- 1.11 Safety

The thermostat is a Class I W unit. It must only be operated with non-inflammable liquids (see also Section 5).

1.12 Important Note

At higher operating temperatures the temperature rise of parts of the bath cover can exceed 60°C. The outflow and return tubes of the pump reach the bath temperature.

## 2. Table of Data

These thermostats meet the requirements of DIN 12879

	Immersion thermostat		Compact thermostats			Medico thermostat
Type	MT	MT/2	MT 3	MT 12	MT 20	MT 6
Temperature range						
without cooling	23...100°C		30...100°C	25...100°C	24...100°C	24...100°C
water-cooled	20...100°C		20...100°C	20...100°C	20...100°C	20...100°C
Operating temperature range (with external cooling)			-20...100°C			
Temperature setting			analog, resolution approx. 0,3°C			
Standard reference thermometer			ET 031:0/100°C, graduated 0,5°C			ET 030:0/70°C graduated 0,5°C
Temperature probe/control action			PTC / proportional			
Temperature control (at 70°C)			± 0,1°C			
Heating load	0...1kW	0...2kW	automatic adjusting as required 0 to 1 kW			0...1kW
Class to DIN 12879			Class 1 W (with R 35 and TS 35 - 200: Class 3)			
Output (pump output)/(pressure)/			8 l/min against zero head/ 0,15 bar (1,5 mWG)			
Liquid volume	up to 50 l		2,5-3,5 l	9-13 l	14-20 l	4-6 l
Bath liquid 5...100°C			deionised water			
below 5°C			water/ethylene glycol mixture 1:1			
Bath opening/depth		--	120x105/ 160mm	300x175/ 160mm	300x350/ 160mm	120x285/ 150mm
Usable liquid depth	min 100 mm		140mm	140mm	140mm	130mm

Immersion thermostat  
 Compact thermostats      Series MT  
 Medico thermostat

- 4 -

	Immersion thermostat		Compact thermostats			Medico thermostat
Type	MT	MT/2	MT 3	MT 12	MT 20	MT 6
Bench area (WxDxH)	105x130x 300mm		160x265x 360mm	350x365x 360mm	350x540x 360mm	145x440x 320mm
Weight	3,5 kg		7,0 kg	12,0 kg	15,0 kg	4,0 kg
Power supply			220 - 240 V, 50/60 Hz Protection Class 1 to VDE 0100			
	1,2 kW	2,1 kW	1,2 kW	2,1 kW	2,1 kW	1,2 kW
Interference suppression	Grade N					
Cat.No. 220 - 240V, 50/60 Hz	LCE 004	LCE 006	LCB 011	LCB 027	LCB 013	LCM 003

### 3. Basic construction

These operating instructions apply to 6 liquid thermostats of different construction, Series MT:

#### Immersion thermostat MT and MT/2

Compact immersion thermostat with different heating load supplied with screw clamp so that the thermostat can be fitted to any bath.

#### Compact thermostats, Types MT 3, MT 12 and MT 20

Combined bath/circulation thermostats with different bath volumes.

#### Medico thermostat MT 6

Bath/circulation thermostat for the clinical laboratory with transparent Makrolon tank.

The common feature of all six models is the thermostat unit MT containing the electronics as well as the circulation pump. Solid state proportional P controller with packet-switching triac. The Table on page 3 contains the main technical data of the thermostats.

If the heater overheats through loss of liquid a temperature limiter switches off heater and pump on all poles. Warning: the heater surface may reach temperatures up to 250°C, especially with complete loss of liquid!

### 4. Safety system

4.1 The DIN specification 12879 for laboratory thermostats entitled: "Liquid Thermostats. General and Safety Requirements" has been in operation since 1.5.1979. This specification lays down the safety devices required and divides thermostats into different safety classes.

#### 4.2 Why can it be dangerous to operate a thermostat?

1. Thermostats are fitted with heaters which provide the necessary heating energy for the thermostatic liquid. If the temperature control fails, or if the liquid level is too low, the heater may reach a temperature which in combination with inflammable thermostatic liquids can cause a fire in the laboratory.

2. When using the thermostat with external circulation, failure of the tubing can cause discharge of hot liquid and endanger persons and material.

The classification of thermostats depends on:

- o whether non-inflammable or inflammable thermostatic liquids are used;
- o whether the thermostat is operated under supervision or unsupervised.

4.3 The units Series MT as described in these Operating Instructions are to Class 1 W. They are suitable only for

- o non-inflammable bath liquids, i.e. preferably water; for operation close to zero the non-inflammable water/ethylene glycol mixture can be used (see Section 5).

#### Important Note

Even with Class 1 W units the user is only protected against hazards from excess temperature and low level.

Further hazards may arise from the type of product being thermostated, e.g. a shift above or below certain temperature levels or breaking of the container followed by reaction with the thermostatic liquid etc. It is impossible to provide protection against all possible cases and they remain largely within the decision and responsibility of the user.

### 5. Bath liquids and tubing

According to Section 4, only non-inflammable liquids may be used.

The operating ranges of the bath liquids and tubing represent general data which may be limited by the operating temperature range of the unit.

#### 5.1 Bath liquids

##### Operating range 5 to 100°C

Use deionised water. Make up evaporation losses at higher temperatures. Losses may be reduced by using suitable bath covers (see Accessories, page 13).

##### Temperatures close to zero and below:

Water/ethylene glycol mixture, preferably Glycoshell P 300, in ratio 1:1.

Operating range	-30 to 100°C	
Boiling point	110°C	Ultra-Therm G 100
Viscosity at 20°C	4 mm <sup>2</sup> /sec	Cat.-No. LZB 009
Non-inflammable		

When working for extended periods at higher temperatures the proportion of water drops slowly. The mixture then approaches the properties of pure glycol and therefore becomes inflammable (flashpoint 128°C). The mixture ratio must therefore be checked from time to time, e.g. against the original mixture, or with a hydrometer.

Immersion thermostat  
Compact thermostats      Series MT  
Medico thermostat

- 7 -

## 5.2 Tubing (continuous lengths)

### Perbunan tubing

Cat.No. RKJ 011

9 mm internal dia. Application range up to 120°C.  
For water and water/glycol mixtures.

### Silicone tubing (per metre)

Cat.No. RKJ 041

4 mm internal dia. Application range up to 120 °C.  
For water and water/glycol mixtures.

Secure tubing with clips to prevent it slipping off.

## 6. Unpacking, assembly and setting up

- 6.1 Goods are packed carefully to prevent transport damage. If the unit should arrive damaged the carrier or the post office has to be informed so that it can be inspected.

### Standard accessories

#### Immersion thermostat MT and MT/2

Reference thermometer ET 031:0/100°C  
Clamping bracket (fitted),  
Operating Instructions

#### Compact thermostats MT 3, MT 12 and MT 20

Reference thermometer ET 031:0/100°C  
Bath cover (MT 3 only)  
1 m Perbunan tubing  
Operating Instructions

#### Medico thermostat MT 6

Reference thermometer ET 030:0/70°C  
2 Reducing nipples  
Operating Instructions



## 6.2 Assembly and setting up

### Immersion thermostat MT and MT/2

Push the reference thermometer into the spring mounting at the side. The thermostat is suspended into the bath to be thermostated (see page 12 for suitable baths) and the clamping screw is tightened. If required the clamping element can be pulled off, turned through 180°C and pushed on again, so that the thermostat can be secured vertically when the bath has sloping sides.

If the accessory set (Cat. No. LCZ 007) is ordered the immersion thermostat can also be secured to a laboratory stand. Screw the fixing rod into the threaded hole at the back (insert a screwdriver into the hole and tighten up).

The pump housing is turned so that the jet nozzle faces the centre of the bath. Turn the nozzle downwards to obtain a smooth liquid surface.

### Compact thermostat MT 3, MT 12 and MT 20

The units are best set up so that the narrow side is to the front. Insert the reference thermometer with mounting into the cover.

If MT 12 or MT 20 has no external system connected to it, the circulation can be greatly improved by pulling off the tubing connecting of the outlet bend to the inlet nipple and turning pump housing and nozzle to face the opposite corner. If this is not required, the pump nipples are linked together with the Perbunan tubing supplied.

### Medico thermostat MT 6

The bath carrier is placed on the Makrolon tank.  
Insert the reference thermometer with mounting into the cover.

## 7. Connecting external systems

### 7.1 Immersion thermostat

The 9 mm i.d. Perbunan tubing (Cat.No. RKJ 011) is pushed directly onto the outlet bend and connected to the external system, the return tubing can be hung into the bath. It is more convenient, however, to use the pressure and return nipples of the accessory set. The nipple set can be fitted either on the left or on the right side as required; the reference thermometer mounting has to be positioned accordingly. The connection to the outlet bend is made with tubing. When operating with photometers, refractometers, etc. which have nipples for 4 mm i.d. tubing the reducer fitting of the accessory set is screwed into the nipples.

## 7.2 Compact thermostats MT 3, MT 12 and MT 20, Medico thermostat MT 6

The tubing is connected to the pump nipples. Pressure nipple always at the front, return nipple at the back. If necessary, use reducer fittings. An adequate flow rate is required to ensure reliable thermostating of the external apparatus. Where the flow cross-section is severely restricted there may be a temperature drop between bath and external system due to the low flow rate. In that case the bath temperature has to be suitably increased.

Secure the tubing with clips to prevent it slipping off.

## 8. Cooling the thermostats

Due to the very low frictional heat generated by the pump it is possible to work without cooling down to just above ambient temperature (approx. 3 to 10°C) (see Table of Data, page 3). Additional cooling is required for lower temperatures. A cooling coil is fitted to the Compact thermostats MT 3, MT 12, MT 20 and the Medico thermostat MT 6 for this purpose. On the Immersion thermostat the cooling coil of the accessory set must be screwed to the clamp.

Cooling can be effected as follows:

Down to 20°C

Mains water; keep the water consumption as low as possible.

Down to -20°C

Use flow-through cooler DLK 5/DLK 15/DLK 30 depending on tank size and temperature. It is essential to work with a water/glycol mixture (ratio 1:1)!

Insulated Silicone tubing (Cat.No. LZS 001) must be used for linking the inlet and outlet nipples of the pump to the connections of the flow-through cooler.

When thermostating an external system the equipment must be arranged in the following order:

Thermostat - external system flow-through cooler - thermostat.


## 9. Starting up

### 9.1 Filling

Fill the unit with deionised water or water/glycol mixture according to Section 5. The liquid volume is indicated on page 3 (Table of Data). The thermostats should never be filled higher than 2 cm below the cover.

While the thermostat is in use the heater must always be covered with liquid! When it is connected up to an external system, check during starting up that the liquid level in the thermostat does not drop too low due to filling up the external system. If necessary, top up with liquid until the correct level is reached.

The bathes MT 12 and MT 20 can be covered with a flat cover (see page 13) or with a gable cover even when there is glassware or other items in the bath. This is advisable especially at higher temperatures.

- 9.2 Connect the unit only to a grounded socket. Check the details on the rating label against the supply voltage.
- 9.3 Ensure that the pump outlets are linked together on MT 3, MT 12, MT 20 and MT 6 when there is no external system (for exception see Section 6).
- 9.4 Select the required temperature setpoint at the temperature knob.
- 9.5 Switch on the mains switch. The green lamp lights up. The yellow lamp "heating"  is on continuously. When the set bath temperature has been reached, the yellow lamp "heating" begins to flash. The set temperature is controlled to an accuracy of better than + 0.1°C.

Check on the reference thermometer that the bath temperature agrees with the selected setpoint. If necessary adjust the temperature setting.


## 10. Operation of the safety circuit

### 10.1 The following three faults could occur:

1. The thermostat is started up without bath liquid or with the liquid level too low (heater partly uncovered).
2. The liquid level drops too much during operation, especially at high temperatures. The same fault may be caused by failure of the tubing and liquid being pumped out of the thermostat.
3. Failure of the control system resulting in continuous heating. The liquid eventually reaches the boiling point and evaporates.

If any of the above faults occur, the safety circuit comes into operation. A built-in temperature probe measures the surface temperature of the heater and switches off the thermostat if a certain limiting temperature is exceeded. According to DIN 12879 this type of protection is called over-temperature protection.

Since the heater surface can reach very high temperatures up to 250°C, especially when the thermostat runs completely dry, only water or a water/glycol mixture may be used in the thermostat; otherwise it is impossible to prevent a fire under all circumstances despite the use of a safety system.

10.2 Operation of the safety circuit switches off the thermostat on all poles (heater and pump); the reset button "Release"  jumps out approx. 3 mm. The operation of the safety circuit can also be seen at switched-on instruments (green lamp lights), the yellow heat control lamp will not light up, even if the setpoint temperature will be increased. The thermostat can only be restarted after

- o the temperature probe on the heater has cooled down to below 60°C
- o the fault has been corrected (liquid level too low, faulty control circuit, burst tubing)
- o the reset button has been pushed in (press firm!).

This ensures that the thermostat cannot start up again automatically, for example through a reduction in the temperature which could suggest that the fault has been rectified.

## 11. Maintenance

LAUDA thermostats are designed for continuous operation. They require no regular maintenance. Contaminated bath liquid should be drained out through the drain cock and replaced with fresh liquid. If the unit should become defective it is recommended that the thermostat unit MT should be removed by a qualified person and that you contact your next service department (sales office).

LAUDA DR. R. WOBSE  
GMBH & CO. KG  
Postbox 12 51

D-6970 Lauda-Königshofen  
West-Germany

Telephone: 09343/503-0  
Telex: 689 523 lauwo d  
Telefax: 09343/503-222

Immersion thermostat  
Compact thermostats      Series MT  
Medico thermostat

- 12 -

Accessories for Immersion/Compact/Medico thermostats

Type	Cat. No.
------	----------

Reference thermometer

0/70°C, graduated 0.5°C	ET 030
0/100°C, graduated 0.5°C	ET 031
-30/100°C, graduated 0.5°C	ET 032

<u>Reference thermometer holder</u>	HKF 036
-------------------------------------	---------

Accessory set

for Immersion thermostats MT and MS consisting of:	LCZ 007
---	---------

Cooling coil  
Pressure and return nipples  
2 pump reducer fittings for tubing 4 mm i.d.  
Mounting rod

Bath tanks

for Immersion thermostats MT and MS

Type	Material	Bath opening/ depth (mm)	Capacity litres	
M 12	Stainless steel	300 x 315/160	12	LCZ 026
M 20	Stainless steel	300 x 490/160	20	LCZ 027
M 25	Stainless steel	300 x 490/200	25	LCZ 028
M 40	Stainless steel	300 x 750/200	40	LCZ 029
M 6	Makrolon	125 x 415/160	6	EU 056

Through-flow Coolers

DLK 5	LFD 001
DLK 15	LFD 102
DLK 30	LFD 103

Immersion thermostat  
Compact thermostats      Series MT  
Medico thermostat

- 13 -

### Stainless steel racks

for test tubes, centrifuge tubes etc.

Bath M 12    up to 2 racks

Bath M 20    up to 4 racks

RD 13	for 56 tubes 10-13 dia.,	80 mm immersion	UG 066
RD 18/1	for 33 tubes 14-18 dia.,	80 mm immersion	UG 067
RD 18/2	for 33 tubes 14-18 dia.,	110 mm immersion	UG 068
RD 30	for 14 tubes 24-30 dia.,	110 mm immersion	UG 069

Bath M 25    up to 4 racks

Bath M 40    up to 7 racks

RE 13	for 56 tubes 10-13 dia.,	80 mm immersion	UG 070
RE 18/1	for 33 tubes 14-18 dia.,	80 mm immersion	UG 071
RE 18/2	for 33 tubes 14-18 dia.,	110 mm immersion	UG 072
RD 30	for 14 tubes 24-30 dia.,	110 mm immersion	UG 073

### Makrolon racks

Bath M 3,    1 rack

Bath M 6    up to 2 racks

for 20 tubes 14 - 17 dia.,	70 mm immersion	UE 022
for 20 tubes 14 - 17 dia.,	100 mm immersion	UE 020

Details on other racks on request.

### Bath cover, (flat), stainless steel

for Model M 20, in 2 parts      LCZ 009

for Model M 12, in one part      LCZ 030

### Gable cover, stainless steel

for Model M 20      LCZ 011

### Tubing (per metre)

Perbunan tubing, 9 mm i.d.      RKJ 011

Silicone tubing, 4 mm i.d.      RKJ 041

Immersion thermostat  
Compact thermostats      Series MT  
Medico thermostat

- 14 -

Reducer fitting for pump

for tubing 4 mm i.d.

HKO 018

UNIPROTECT R 35

LRS 002

Universal over-temperature and low-level protection.  
Retrofitting with R 35 provides every thermostat with  
protection to Class 3 DIN 12 879. Accessories required:  
immersion probe TS 35-200 and special holder.

Immersion probe TS 35-200

US 014

Clamping bracket for immersion thermostat and M 6

UD 048

Retrofit bracket for M 3, M 12, M 20

UD 049

Rising floor (for retrofitting)

LCZ 012

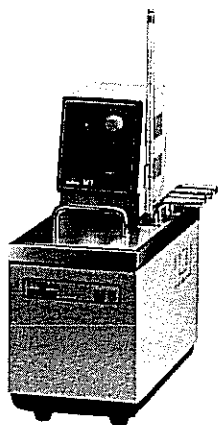
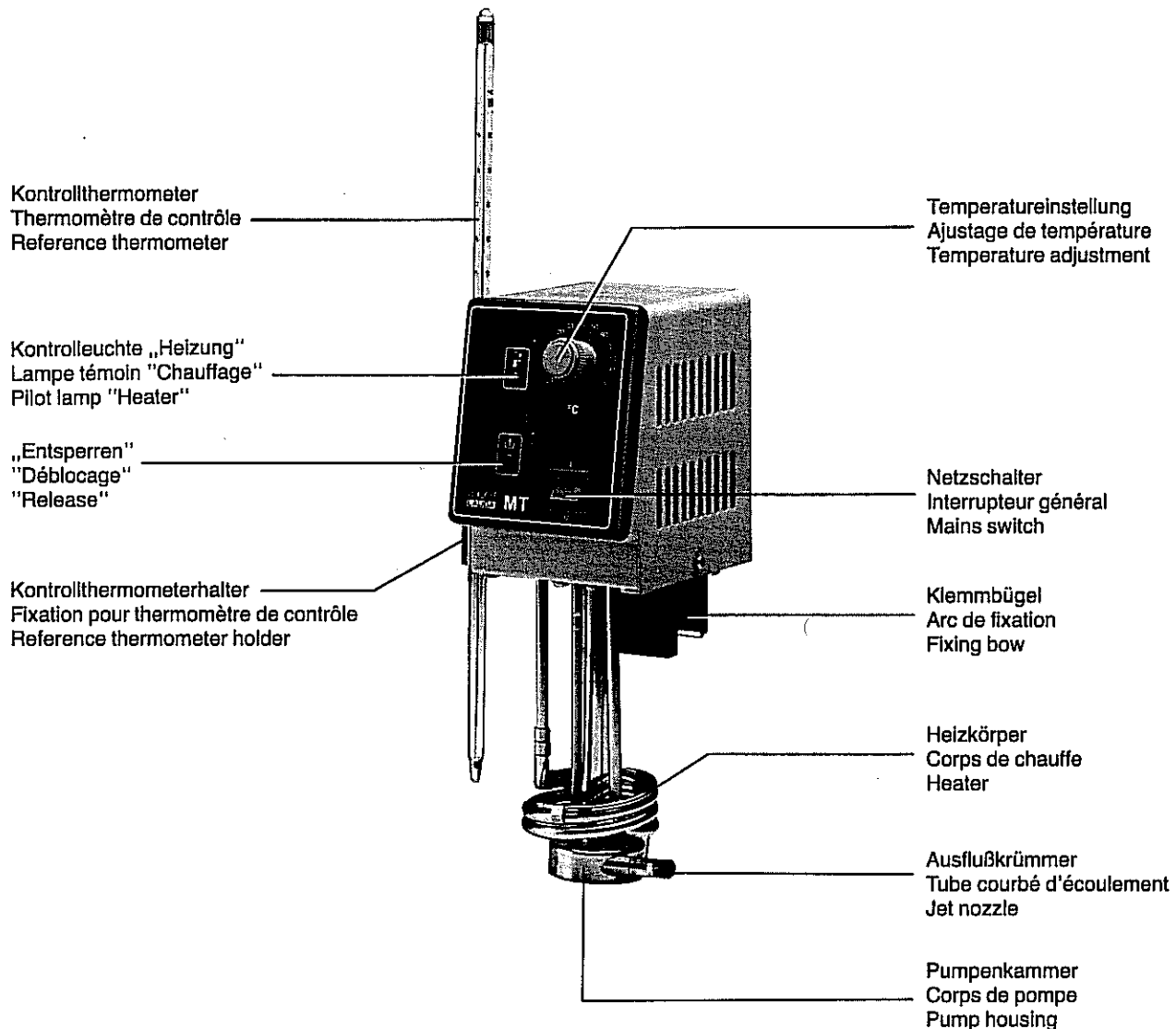
Usable area 250 x 160 mm, continuous height adjustment

Bath M 12: 1 floor can be fitted

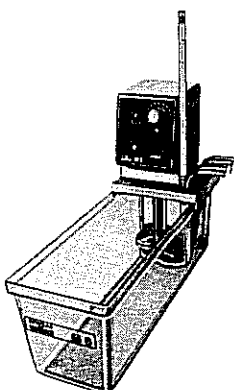
Bath M 20: 2 floors can be fitted

**Thermostate, Reihe MT**  
**Thermostats, Série MT**  
**Thermostats, Series MT**

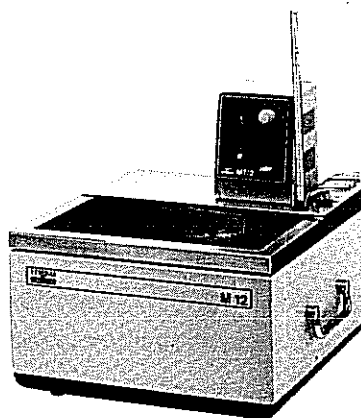
**LAUDA**



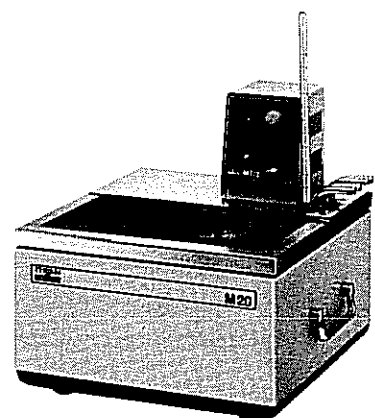
**MT 3**



**MT 6**



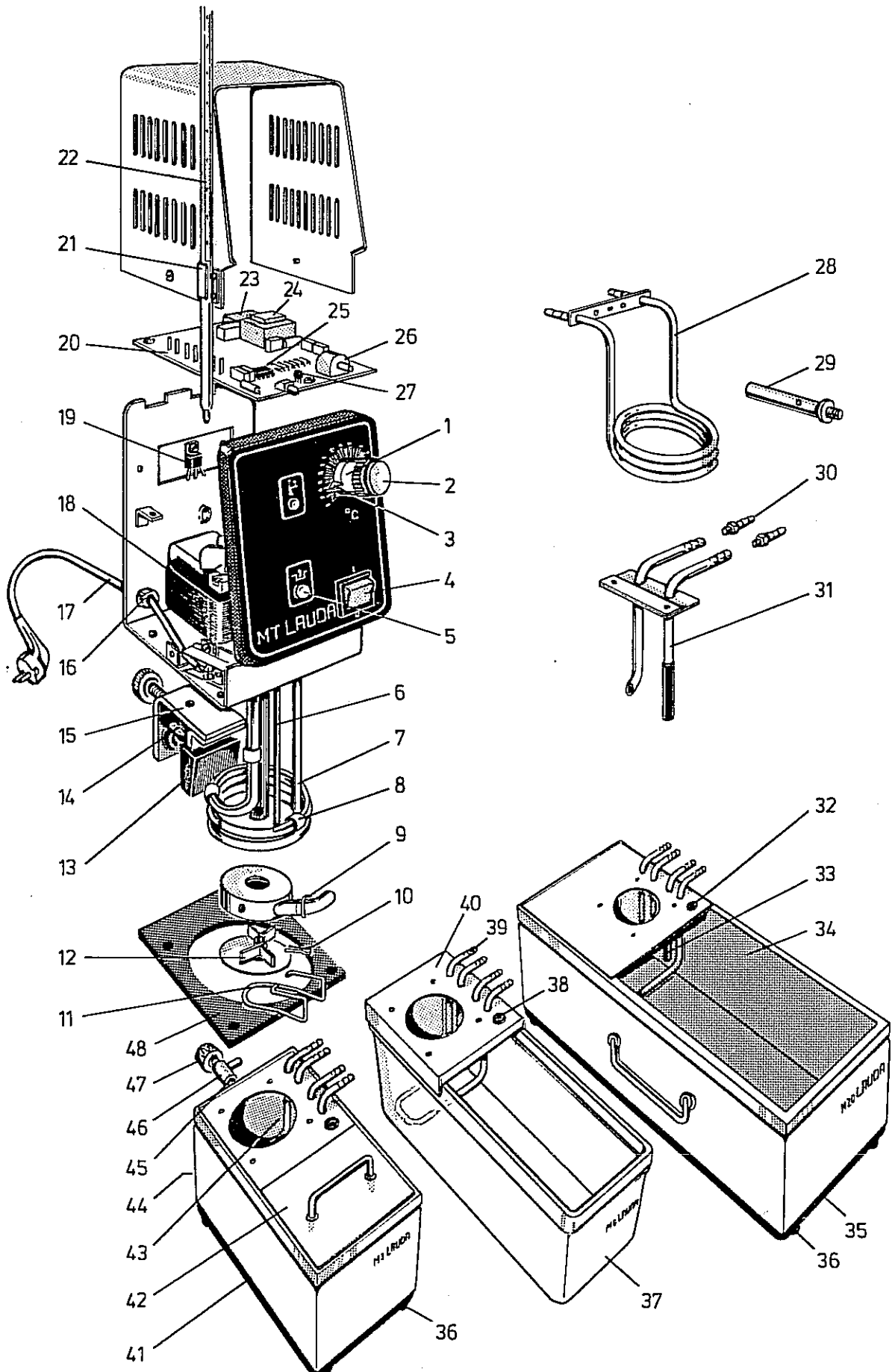
**MT 12**



**MT 20**



Ersatzteile/Pièces détachées/Spare parts  
MT, MT/2, MT 3, MT 6, MT 12, MT 20



Ersatzteile/Pièces détachées/Spare parts  
MT, MT/2, MT 3, MT 6, MT 12, MT 20

Best.Nr. / No. Rêf. / Ref. No.

1	Drehknopf/Bouton rotatif/Rotary knob	EZD	049
2	Kappe/Calotte/Cap	EZD	051
3	Mutterabdeckung/Couverture d'écrou/Nut covering	EZD	052
4	Netzschalter/Interrupter secteur/Mains switch	EST	054
5	Temperaturbegrenzer/Limiteur de température/Temperature limiter		
	MT, MT 3, MT 6	US	025
	MT/2, MT 12, MT 20	US	029
6	PTC-Fühler/Sonde PTC/ PTC-probe	ETP	023
7	Heizkörper/Corps de chauffe/Heater 220-240 V		
	MT, MT 3, MT 6 - 1 kW	UH	088
	MT/2, MT 12, MT 20 - 2 kW	UH	120
8	Klemme/Pince/Clamp	HIB	012
9	Feder/Ressort/Spring	HI	012
10	Splint/Goupille/Split pin	DIS	003
11	Spange/Agrafe/Clip	HI	014
12	Rührpropeller/Hélice/Stirrer	HX	102
13	Klemmschutz/Protection pour pince/Clamp protection	EDK	006
14	Distanzstück/Douille d'écartement/Distance piece	EDK	007
15	Klemmbügel/Arc de fixation/Fixing bracket	UD	065
16	Zugentlastung/Protection pour câble/Cable tension relief	EKZ	009
17	Netzkabel mit Stecker/Câble secteur avec fiche/Mains cable with plug		
	MT, MT 3, MT 6	EKN	009
	MT/2, MT 12, MT 20	EKN	001
18	Motor/Moteur/Motor 220-240V	EM	039
19	Triac/Triac/Triac	EYY	008
20	Leiterplatte "Regelung"/Circuit imprimé "Réglage"/Printed circuit "Control"	UL	190
21	Thermometerhalter/Fixation de thermomètre/Thermometer holder	HIB	005
22	Kontrollthermometer/Thermomètre de contrôle/Reference thermometer		
	0...70°C	ET	030
	0...100°C	ET	031
23	Zündübertrager/Translateur d'ignition/Ignition transducer		
	BV 282 - 1 - 00054	EIZ	005
24	Transformator/Transformateur/Transformer 220V		
	BV 178 - H01	EIT	068
25	Nullspannungsschalter/Commutation de tension nulle/Zero switching triac U 217 B	EYI	049
26	Potentiometer/Potentiomètre/Potentiometer 10 kOhm	EWD	043
27	Transistor/Transistor/Transistor BC 257 A	EYT	003
28	Kühlschlange/Serpentin de refroidissement/Cooling coil	UO	036
29	Stativstab/Tige de statif/Rod for stand	HSD	022
30	Reduzierolive/Olive réductrice/Reducer	HKO	018
31	Druck- und Rücklaufstutzen/Tubulures de refoulement et de retour/Outlet-Inlet connection	UO	011
32	Thermometerhalter/Fixation de thermomètre/Thermometer holder	HKF	036
	Feder/Ressort/Spring	HI	019
33	Perbunanschlauch/Tuyau Perbunan/Perbunan tubing	HOF	005

Ersatzteile/Pièces détachées/Spare parts  
MT, MT/2, MT 3, MT 6, MT 12, MT 20

Best. Nr. / No. Rêf. / Ref. No.

34	Temperiereinheit kompl. (Innenkessel, Badbrücke, Pumpenstutzen mit Kühlschlange)/Unité de thermostatisation compl. (Cuve intérieure, Pont du bain, Tubulure avec serpentin de refroidissement)/Thermostatic unit compl. (Inner vessel, Bath bridge, Pump nozzle with cooling coil)	M 20 M 12	UU UU	041 054
35	Bodenwanne/Fond de la cuve/Bath bottom	M 20 M 12	HGB HGB	105 134
36	Gummifuß/Pied en caoutchouc/Rubber food		EZG	009
37	Badgefäß/Cuve de bain/Bath vessel		EU	056
38	Thermometerhalter/Fixation de thermomètre/Thermometer holder		HKF	035
	Feder/Ressort/Spring		HI	019
39	Pumpenstutzen mit Kühlschlange/Tubulure avec serpentin de refroidissement/Pump nozzle with cooling coil		UO	038
40	Badbrücke/Pont du bain/Bath bridge		HPB	038
41	Bodenwanne/Fond de la cuve/Bath bottom		HGB	100
42	Einfülldeckel/Couvercle de remplissage/Filling cover		HDQ	038
43	Temperiereinheit kompl. (Innenkessel, Badbrücke, Pumpenstutzen mit Kühlschlange)/Unité de thermostatisation compl. (Cuve intérieure, Pont du bain, Tubulure avec serpentin de refroidissement)/Thermostatic unit compl. (Inner vessel, Bath bridge, Pump nozzle with cooling coil)	M 3	UU	040
44	Gummitülle/Douille en caoutchouc/Rubber piece		EDT	007
45	O-Ring/Joint torique/O-Ring		EDO	018
46	Entleerungshahn kompl. /Robinet de vidange compl./Drain cock compl.		UD	070
47	Drehknopf/Bouton rotatif/Rotary knob		EZD	001
48	Dichtung/Joint/Gasket		EDF	047

